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(54) Syringe

(57) The syringe of the invention has a barrel and an assembly of a plunger slidable in the barrel and an operating handle for the plunger and is characterized by incorporating a coupling between the two elements of the assembly in which spring fingers presented by one element of the assembly are engageable with an annular groove presented by the other element of the assembly.

In operation, when the plunger is fully within the barrel the fingers engage the groove and the handle is coupled to the plunger. If the handle is pulled so far back that the plunger begins to leave the barrel the fingers spring apart out of the groove and the plunger and the handle become disconnected.

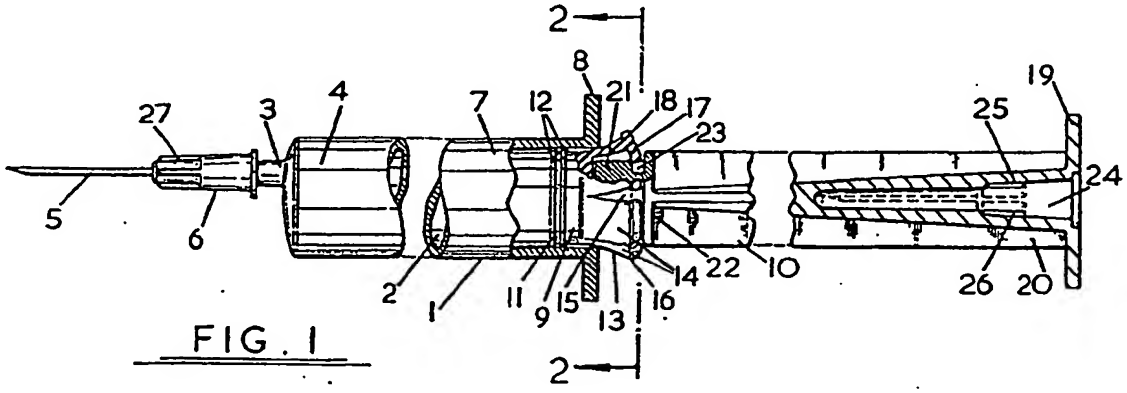

FIG. 1

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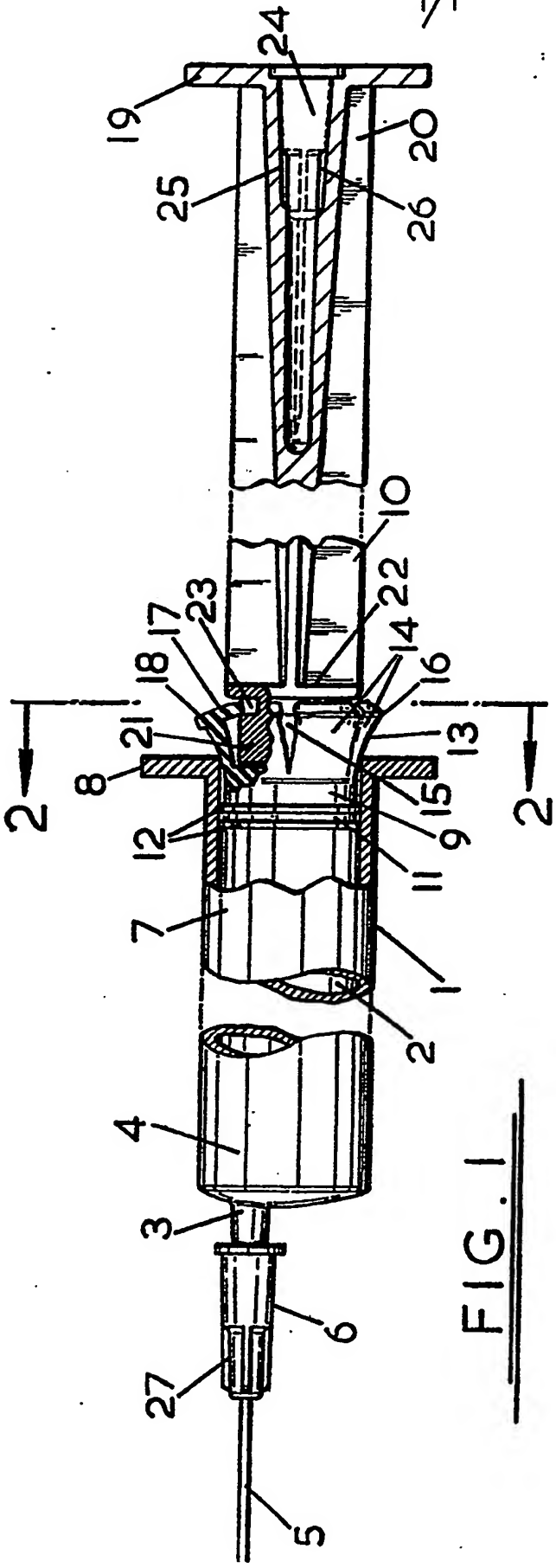

FIG. 1

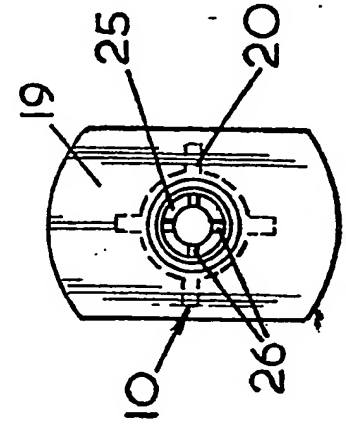

FIG. 3

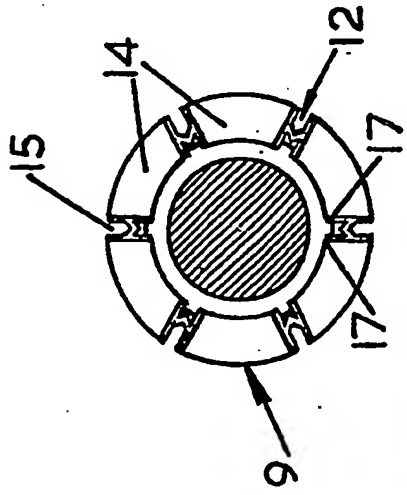

FIG. 2

SPECIFICATION
Syringe

This invention relates to syringes of the type incorporating a cylindrical barrel incorporating a plunger, an operating handle for the plunger projecting from one end of the barrel, and a discharge nozzle such as a needle leading from the other end of the barrel.

In syringes as they are customarily made and particularly in hypodermic syringes of the disposable type i.e. syringes which are intended to be discarded after being used once only there is usually no restraint on the plunger during its movement away from the distal end of the syringe, that is the end from which the needle projects when the syringe is in use. The result of this form of construction is that a plunger can by inadvertence or carelessness be withdrawn completely from the barrel during the act of drawing a quantity of liquid into the barrel. Such a sudden withdrawal of the plunger invariably causes spillage of liquid from the now open end of the barrel.

It also may happen that it is desired, for example during the taking of a blood sample, that the contents of the syringe should be retained therein so that with removal of the needle the syringe barrel will act as a phial. This requires that the handle attached to the plunger for operating the plunger should be readily removable from the plunger leaving the plunger in sealing engagement with the walls of the barrel. Although many syringes in use today do have their plunger operating handles detachably connected to the plungers, separation of the two is quite difficult and usually cannot be safely carried out with the plunger still in the barrel. One reason is that the usual form of connection is some form of rotary connection, for example a screw thread or a bayonet connection. One drawback of a rotary connection is that for operation it requires that the friction between the plunger and the barrel should be greater than the friction in the connection between the plunger and the handle otherwise on rotating the handle to withdraw it from the plunger, the plunger will rotate in the barrel and after all the plunger should be an easy sliding fit in the barrel, the handle will not become detached and there is no way of detaching it without withdrawing the connected plunger and handle from the barrel. Also this construction suffers from the drawback referred to above that the plunger can be accidentally or carelessly withdrawn from the barrel.

What is required is a syringe which incorporates a connection between the handle and the plunger which is automatically disconnectible before the plunger can leave the barrel and does not rely on any differential frictional effect for its operation. It is an objection of the present invention to provide such a syringe.

According to the invention a syringe having a barrel and an assembly of a plunger slidable in the incorporates a coupling between the two elements of the assembly in which one element of the assembly presents several axially projecting spring fingers with their tips inturned towards the axis of the syringe, the fingers in their unstressed condition being splayed and the other member of the assembly is formed with an annular groove engageable by the inturned tips of the fingers when the elements are fitted end to end and the fingers are pressed radially inwards.

In one construction the fingers are formed on a ring fitted as a ferrule to the member presenting the fingers.

The member presenting the fingers may be the plunger or the handle, the other member being formed with the groove.

For certain applications it is advantageous that the member presenting the fingers should be the plunger because then the fingers may be additionally formed with outwardly projecting abutments for a purpose to be described.

The handle may be formed with a recess into which the nozzle where the nozzle is detachable and particularly where the nozzle is a hypodermic needle, may be stored before or after the syringe is used.

In a syringe according to the present invention it is possible to detach the handle readily so that the syringe barrel full of liquid may be used as a storage phial with the plunger acting as a stopper. The construction of the invention also avoids the possibility that the handle of a full syringe may be accidentally pushed back in thereby expelling the contents of the syringe.

A practical embodiment of the invention is illustrated in the accompanying drawings in which Fig. 1 is a partially sectioned side view of a hypodermic syringe showing the plunger in its fully retracted position with the handle in the process of disengagement from the plunger, Fig. 2 is a section on the line 2—2 of Fig. 1 and Fig. 3 is a rear end view of the handle of Fig. 1.

In the drawings 1 denotes a barrel having a hollow interior 2 and furnished with a Luer type outlet spigot 3 at the forward end 4. A hypodermic needle 5 includes a Luer fitting connector portion 6 which is push-fit mounted on the outlet spigot 3. The rear end 7 of the body 1 is provided with finger lugs 8.

A plunger 9 is reciprocably mounted inside the barrel 1 by means of an elongated handle 10.

In more detail the plunger 9 is in the form of a substantially cylindrical element of a resiliently deformably polymeric material such as a natural or synthetic rubber. At its forward end portion 11 the plunger is a clearance fit in the barrel 1 and presents two sealing rings 12.

The plunger 9 has a rear end portion 13 and a plurality of axially radially projecting spring fingers 14 separated by notches 15 such that when the plunger 9 is pushed fully inside the barrel 1 the fingers 14 move radially towards one another into the gap 18 formed by the reduced diameter adjacent end 21 of the handle 10. Outwardly

the double purpose of preventing the plunger 9 from being accidentally pushed into the barrel 1 when the barrel is full of liquid and the plunger is intended to act as a stopper and when the plunger 9 is forced into the barrel to expel the contents serving to reduce friction on the walls of the barrel by holding the remaining portions of the fingers 14 off the walls of the barrel. The fingers 14 have inturned tips 17 which are engageable with an annular groove 23 in the reduced diameter end 21 of the handle 10 when the plunger 9 is forced into the barrel 1 by the handle 10 and the fingers 14 are pressed radially inwards. When the fingers 14 are fully clear of the barrel 1 they spring to a position clear of the groove 23.

The handle 10 has an elongated body of generally cruciform cross-section formed of webs radiating from a centre portion 28 furnished at its rear end 20 with finger lugs 19.

The rearward end 20 of the handle 10 is provided with an axially extending recess 24 for accommodating a hypodermic needle 5 (shown in dashed outline). A rearward portion 25 of the recess 24 has a form generally complementary to the connector portion 6 of the hypodermic needle 5 so that the latter is a push-fit therein. Thus the engagement portion 25 has radially inwardly extending lugs 26 which interengage with those 27 formed on the outside of the needle connector portion 6 during crimping thereof around the needle element during manufacture of the hypodermic needle.

The syringe is filled in the usual manner by withdrawing the plunger 9 by means of the handle 10 until the fingers 14 emerge from the barrel 1 whereupon they spring outwardly withdrawing the inturned tips 17 from the groove 23 in the handle 10 so that the plunger 9 becomes detached from the handle 10 and remains as a stopper in the end of the chamber by the frictional force between the plunger 9 and the walls of the barrel 1.

The rear end of the detached handle 10 is then applied to the front end of the syringe so that the needle 5 enters the recess 24 and the handle is pressed on to the connector portion 6 of the needle.

On axially pulling apart the barrel 1 and the handle 10 the frictional engagement forces between the connector portions 6 and 24 retain the needle 5 in the recess as the needle 5 is withdrawn from the spigot 3 of the barrel 1.

The different components of the syringe may be made of various materials, conveniently those used in conventional devices. Thus the plunger may be made of an inert resiliently deformable polymeric material such as natural or synthetic rubber. The handle and the barrel may be made of a substantially rigid inert plastics material such as polypropylene, polystryene or a polyacrylate material. The barrel is preferably made of a clear material to permit observation of the interior of the barrel.

CLAIMS

1. A syringe having a barrel and an assembly of a plunger slidable in the barrel and an operating handle for the plunger which is characterized by incorporating a coupling between the two elements of the assembly in which one element of the assembly presents several axially projecting spring fingers with their tips inturned towards the axis of the syringe, the fingers in their unstressed condition being splayed and the other member of the assembly is formed with an annular groove engageable by the inturned tips of the fingers when the elements are fitted end to end and the fingers are pressed radially inwards.

2. A syringe as claimed in claim 1 in which the fingers are formed on a ring fitted as a ferrule to the member presenting the fingers.

3. A syringe as claimed in claim 1 in which the member presenting the fingers is the plunger, the handle being formed with the groove.

4. A syringe as claimed in claim 1 in which the member presenting the fingers is the handle, the plunger being formed with the groove.

5. A syringe as claimed in claim 3 in which the fingers are additionally formed with outwardly projecting abutments.

6. A syringe as claimed in claim 1 in which the handle is formed with a recess and the barrel carries a detachable nozzle in the form of a hypodermic needle, the recess in the handle being arranged to receive and store the needle.

7. A syringe substantially as described with reference to the accompanying drawings and as claimed in claim 1.

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